



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

Address: COMMISSIONER FOR PATENTS

P.O. Box 1450

Alexandria, Virginia 22313-1450

www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/520,495

01/05/2005

Fulvio Costa

033965.005

9871

25461

7590

08/05/2008

SMITH, GAMBRELL & RUSSELL

SUITE 3100, PROMENADE II

1230 PEACHTREE STREET, N.E.

ATLANTA, GA 30309-3592

EXAMINER

EMPIE, NATHAN H

ART UNIT

PAPER NUMBER

1792

MAIL DATE

DELIVERY MODE

08/05/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/520,495

Applicant(s)

COSTA ET AL.

Examiner

NATHAN H. EMPIE

Art Unit

1792

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 July 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 21-41 is/are pending in the application.
- 4a) Of the above claim(s) 22,23,37 and 41 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 21,24-36 and 38-40 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB-08)
Paper No(s)/Mail Date 1/5/05, 6/15/05
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Election/Restrictions

Applicant's election of Group I, claims 21, 24-36 and 38-40 in the reply filed on 7/3/08 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)). Claims 22, 23, 37, and 41 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected inventions, there being no allowable generic or linking claim.

Claim Objections

Claim 38 is objected to because of the following informalities: the word "deep" as claimed as a method of coating ("deep coating") is believed to be a typo for "dip" as "dip coating" is taught by the applicant's specification (pg 8 line 19) (and "deep coating" is not taught). Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 21, 24- 33, and 38 – 39 are rejected under 35 U.S.C. 102(b) as being anticipated by Kim et al. (Surface Modified SiO₂ Xerogel films from HMDS / Acetone for

Intermetal Dielectrics, paper from 2000 International Microprocesses and Nanotechnology Conference, 11-13 July 2000; hereafter Kim).

Claims 21, 24, and 25: Kim teaches a process for the preparation and deposition of a vitreous film (SiO_2 xerogel film) on a substrate (such as silicon) (pg 218-219) comprising:

Preparing a solution in an aprotic solvent (acetone) of at least one alkoxide such as tetraethylorthosilicate (TEOS) (see, for example, pg 218, last paragraph)

Hydrolyzing the solution in the presence of a catalyst (HCl) in a hydrolysis reaction to obtain a hydrolysis reaction product (see, for example, pg 218, last paragraph);

Depositing the hydrolysis reaction product on the substrate (the sol was spun on a p-type Si substrate (see, for example, pg 218, last paragraph).

Claim 26: Kim further teaches wherein the solution of the alkoxide in aprotic solvent possesses a TEOS : Acetone molar ratio is 1:4 (see, for example, pg 218, last paragraph), which yields an approximate weight % of the alkoxide in the solvent of ~57% (FW TEOS ~208.32g/mol, FW acetone~58.08)

Claim 27: Kim further teaches wherein hydrolyzing of the alkoxide is accomplished by adding a controlled quantity of water (hydrolysis process for sol is preferably contains 2.5 mol of water, (see, for example, pg 218, last paragraph)).

Claims 28 – 30: Kim further teaches wherein the molar ratio of H_2O / Me (Si) is 2.5 (see, for example, pg 218, last paragraph);

Claims 31 – 33: Kim further teaches where hydrolyzing of the alkoxide is accomplished in the presence of an acid catalyst selected from the group consisting of mineral and organic acids with K_a of 0.1 to 3, further an aqueous solution of HCl, (see, for example, pg 218, last paragraph), wherein a molar ratio of alkoxide / acid is 1/0.0018 (see, for example, pg 218, last paragraph).

Claims 38 – 39: Kim further teaches wherein the coating is deposited by spin coating (see, for example, pg 218, last paragraph).

Claims 21, 24-25, 27, 31-33, 38, and 40 are rejected under 35 U.S.C. 102(b) as being anticipated by Hata et al. (US patent 4,816,049; hereafter Hata).

Claims 21, 24, and 25: Hata teaches a process for the preparation and deposition of a vitreous film (glassy coating) on a substrate (such as phosphate-based laser glass) (see, for example, col 2 lines 38 - 44) comprising:

Preparing a solution of at least one alkoxide such as methyltriethoxysilane and tetraethylorthosilicate (tetraethoxyxilane) in an aprotic solvent (such as acetone) (see for example, col 3 lines 19 – 66);

Hydrolyzing the solution in the presence of a catalyst (HCl) in a hydrolysis reaction to obtain a hydrolysis reaction product (see for example, col 3 lines 52 – 55)

Depositing the hydrolysis reaction product on the substrate (see for example, col 4 lines 31 – 34);

Claim 27: Hata further teaches wherein hydrolyzing of the alkoxide is accomplished by adding a controlled quantity of water (see, for example, col 3 lines 51 – 55, col 4 lines 21 – 30).

Claims 31 – 33: Hata further teaches where hydrolyzing of the alkoxide is accomplished in the presence of an acid catalyst selected from the group consisting of mineral and organic acids with K_a of 0.1 to 3, further an aqueous solution of HCl, (see, for example, col 3 lines 51 – 55, col 4 lines 21 – 30), wherein a molar ratio of alkoxide / acid is between 2/0.01 to 1/1 (col 3 lines 51 – 55, col 4 lines 21 – 30).

Claim 35 / 36: Hata further teaches wherein the coatings are dried and controllably heat treated from temperatures between room temperature to 500°C wherein the alcohol byproducts are controllably desolventized (removed via evaporation / burn off) (see, for example, col 4 lines 35 - 55, and examples 1 – 12)

Claim 38: Hata further teaches deposition via dip coating (col 4 lines 31 - 35).

Claim 40: Hata further teaches wherein final drying (heat treating) occurs at temperatures between 350°C and 500°C (see for example, col 4 lines 35 – 55).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim.

Claim 34: Kim teaches the method of claim 33 wherein a molar ratio of alkoxide / acid is 1/.0018 (described in the 35 USC 102(b) rejection using Kim, above), and Kim additionally teaches that by varying the catalyst concentration will influence on the transparency of sol and gelling time (see, for example, pg 218, last paragraph). Kim does not explicitly teach that the molar ratio of alkoxide to acid is preferably from 1/0.1 to 1/0.01, but it would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated such a ratio within such a claimed range since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Claims 35–36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim as applied to claim 21 above, and further in view of Minami et al (US 2002/0160153 A1; hereafter Minami).

Claims 35-36: Kim teaches the method of claim 21 (described above), and further teaches wherein shrinkage, cracking, and collapse of structure of the sol-gel coating are considerations that can be deleterious to film performance so they should be addressed (see, for example, pg 218 paragraphs 1-3), but Kim does not explicitly teach the removal of the alcohol byproduct formed by the hydrolysis process. Minami teaches a method of forming a sol-gel derived film by a hydrolysis process involving a metal alkoxide in a solvent (see, for example, [0008]-[0023]). Minami further teaches that shrinkage and cracking of the resulting film can be prevented by partial and

Art Unit: 1792

controlled desolventization (evaporating the alcohol and water which are the products from the reaction of the sol-gel material, see, for example, [0041]). Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated a step of evaporating alcohol byproduct from the sol, as taught by Minami, into the method of Kim as it help to reduce shrinkage and cracking in the final coating.

Claim 40 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kim as applied to claim 21 above, and further in view of Ravaine et al (US patent 4,923,950; hereafter Ravaine).

Claim 40: Kim teaches the method of claim 21 (described above), and Kim further teaches wherein it is known in the art to use dried SiO_2 xerogel films for intermetal dielectrics (pg 218-219), but Kim is silent as to a specific drying temperature; therefore Kim does not explicitly teach a final drying at a temperature of 20 to 500°C. When a primary reference is silent as to a certain detail, one of ordinary skill would be motivated to consult a secondary reference which satisfies the deficiencies of the primary reference. Ravaine teaches a method of forming a sol-gel derived film by a hydrolysis process involving a silicon alkoxide in a solvent (see, for example, abstract, col 3 lines 26 – 50). Ravaine further teaches that to form a xerogel, all of the alcohols and water must be removed from the gel by drying at a temperature around 120°C (col 3 lines 44 – 50) . Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated a temperature of around 120°C, as taught by Ravaine, as the drying temperature for the dried xerogel in the process of Kim, as

Kim was silent and such a temperature is taught to predictably dry the gel to form a xerogel.

Claims 26, 28-30, and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hata.

Claim 26: Hata further teaches (see the 35 USC 102(b) rejection using Hata, above) a preferred mixing ratio (by mole) of sol gel components (col 4 lines 25 – 30), wherein the molar ratio of metal alkoxides to aprotic solvent is defined between 2/1 – 1/40 (col 4 lines 25 – 30), but Hata does not explicitly teach where the solution of the alkoxide or mixture of alkoxides in the aprotic solvent is from 30%-60% by weight. It would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated a solution of the alkoxide or mixture of alkoxides in the aprotic solvent is from 30%-60% by weight as in the case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

Claim 28 – 30: Hata further teaches a preferred mixing ratio (by mole) of sol gel components (col 4 lines 25 – 30), wherein the molar ratio of water / Me is between 0.5 – 20 (col 4 lines 25 – 30), but Hata does not explicitly teach where the molar ratio of water / Me is from 2 to 3. It would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated a molar ratio of the claimed range since in the case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a

Art Unit: 1792

prima facie case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

Claim 34: Hata teaches the method of claim 33 (above) further teaches wherein a molar ratio of alkoxide / acid is between 2/0.01 to 1/1 (col 3 lines 51 – 55, col 4 lines 21 – 30), but Hata does not explicitly teach where the molar ratio of alkoxide to acid is preferably from 1/0.1 to 1/0.01. It would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated a molar ratio of the claimed range since in the case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a *prima facie* case of obviousness exists. In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hata as applied to claim 21 above, and further in view of Teranishi et al (US patent 5,693,365; hereafter Teranishi).

Claim 39: Hata has taught the method of claim 21 (described above), where the sol-gel derived film formed by a hydrolysis process involving a silicon alkoxide in a solvent is applied to a phosphate based glass to provide water resistance (see, for example col 2 lines 22-45). But Hata does not explicitly teach wherein the coating is deposited via spin coating. Teranishi teaches a method of forming a silicon alkoxide based sol-gel coating on a phosphate based glass surface to provide a water resistant coatings to planar surfaces (see, for example, abstract, col 4 lines 6 – 21). Teranishi further teaches that it is well known in the art to predictably deposit silica based water

Art Unit: 1792

resistant sol-gel coatings to planar substrates via spin coating (col 4 lines 3 – 5).

Although the method of Hata is directed toward coating fiber / rod shaped phosphate-based glass articles, Teranishi has taught that planar shaped phosphate glass articles require water resistant coatings as well. Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to have incorporated a spin coating process, as taught by Teranishi, as the form of deposition in the method of Hata, as provides a predictable means of applying a silicon alkoxide based sol-gel coating on a phosphate based glass surface to provide a water resistance to planar surfaces.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATHAN H. EMPIE whose telephone number is (571)270-1886. The examiner can normally be reached on M-F, 7:00- 4:30 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on (571) 272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1792

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/N. H. E./
Examiner, Art Unit 1792

/Katherine A. Bareford/
Primary Examiner, Art Unit 1792